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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/29/2003

Paul Lecoq

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12/06/2005

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EXAMINER

GAGLIARDI, ALBERT J

ART UNIT

PAPER NUMBER

2884

DATE MAILED: 12/06/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

EL

Office Action Summary	Application No. 10/696,550	Applicant(s) LECOQ, PAUL	
	Examiner Albert J. Gagliardi	Art Unit 2884	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 December 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 29 December 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) ☐ All b) ☐ Some * c) ☐ None of:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
 Paper No(s)/Mail Date 12/03.
- 4) ☐ Interview Summary (PTO-413)
 Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Drawings

1. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the use of LuYAP scintillators must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as “amended.” If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either “Replacement Sheet” or “New Sheet” pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

2. The disclosure is objected to because of the following informalities: The disclosure includes numerous references to figures, graphs and tables supposedly identifying LuYAP

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scintillators and/or properties thereof, however no of the figures, graphs or tables include LuYAP scintillators.

Appropriate correction is required.

Claim Objections

3. Claim 19 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. The scintillator of claim 19 is recited in claim 1.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claims 1-19 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for devices utilizing scintillators such as LSO, LuAP and GSO, for example, does not reasonably provide enablement for LuYAP scintillators and/or the advantage thereof. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make the invention commensurate in scope with these claims. The examiner notes that while the specification includes numerous references to LuYAP scintillators and the properties thereof which suggest the suitability of the scintillators for use in PET imaging systems, the drawings do not provide support for the alleged properties.

Claim 6 (dependent on claim 3) recites the limitation “the determining means.” There is insufficient antecedent basis for this limitation in the claim. The examiner notes that a determining means is first recited in claim 5, which is not in the chain of dependency.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 1-6, 13 and 17-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen *et al.* (US 6,528,793 B1) in view of Chval *et al.* (Development of New Mixed $\text{Lu}_x(\text{RE}^{3+})_{1-x}\text{AP}$: Ce Scintillators).

Regarding claim 1, Chen discloses (Figs. 1, 2) a positron emission tomography camera or scanner (10) comprising: a patient area, a detector ring (18) for detecting radiation from opposite sides of the patient area, the ring including a plurality of scintillation detectors (16) directed towards the patient area, the scintillation detectors being such as to emit light when radiation is incident thereon (inherent property of scintillators), and converting means (i.e., PMTs – col. 9, line 36) optically coupled to the scintillation detectors (16) for converting light emitted by the scintillation detectors to electrical pulses, wherein each of the plurality of scintillation detectors comprises LSO or GSO (col. 9, lines 26-30).

Regarding the material being lutetium-yttrium-aluminate-perovskite, $\text{Lu}_x\text{Y}_{1-x}\text{AP}$ (where $0.5 \leq x \leq 0.995$), Chval discloses an alternative scintillator crystal for PET systems comprising lutetium-yttrium-aluminate-perovskite, $\text{Lu}_x\text{Y}_{1-x}\text{AP}$ scintillator crystal (p. 332, par. 2-3) with

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properties that meet or exceed those of other well known and scintillators such as GSO (p. 339, par.2). Regarding the range of lutetium as $0.5 \leq x \leq 0.995$, it is noted that while the specific embodiments disclosed show values of $x \leq 0.3$ (see table 4), *Chval* further teaches that in PET imaging application the concentration of lutetium should be increased significantly to the point that the Yttrium content is at it lowest concentration possible to preserve the perovskite phase during growth (p. 341, par. 1). As such, it would have been obvious to a person of ordinary skill in the art to modify the system suggested *Chen* in view *Chval* so as to utilize a mixed LuYAP scintillator with improved performance and high stopping power.

Regarding claim 2, in the system suggested by *Chen* in view of *Chval*, *Chen* discloses that each of the scintillation detectors comprise at least one further scintillating layer (see generally Figs. 2, 8).

Regarding claim 3, in the system suggested by *Chen* in view of *Chval*, *Chen* discloses that each the at least one further layer of material disposed adjacent the LuYAP material may comprise on of LSO or GSO.

Regarding claim 4, although *Chen* in view of *Chval* does not specifically suggest the use of two layers of the LuYAP wherein the relative ratio of Lu and Y are different for the two layers, *Chen* does disclose that DOI information determination relying on pulse shape discrimination merely requires the use of scintillation layers wherein the different layers have appropriate differences in decay time constants (col. 4, lines 58-67). Since different decay constants are a well known and inherent property of LuYAP scintillators with varying concentrations of Lu and Y, the use of first and second layers with varying concentrations would have been an obvious design choice in view of the inherently different decay time constants

thereof and the known suitability of such scintillators for use in PET imaging applications as suggested by *Chval*.

Regarding claim 5, in the system suggested by *Chen* in view of *Chval*, *Chen* discloses a determining means (col. 9, lines 30-56) for determining whether detected radiation was incident on the LuYAP layer or the other layer.

Regarding claim 6, as best understood, in the system suggested by *Chen* in view of *Chval*, *Chen* discloses that the determining means analyses a signal to determine a pulse shape to indicate the layer in which the radiation was incident (col. 9, lines 30-56).

Regarding claim 13, *Chen* discloses that the converting means is a PMT (see generally Fig. 8).

Regarding claims 17-18 the PET scanner and recited according to the claims is suggested by the apparatus suggested by *Chen* in view of *Chval* as applied to claims 1 and 2 above, and is rejected accordingly.

Regarding claim 19 the scintillator recited according to the claim 19 is suggested by the apparatus suggested by *Chen* in view of *Chval* as applied to claims 1 above, and is rejected accordingly.

8. Claims 7-12 and 15-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Chen* in view of *Chval* as applied above, and further in view of Fitzpatrick (US 5,493,121).

Regarding claim 7, although *Chen* in view of *Chval* does not specifically suggest the use of a wavelength divider interposed between the scintillator and the converting means, *Fitzpatrick* discloses (Fig. 4) the known use of wavelength dividers (20A) for affecting different sub-populations of light from the scintillator in different ways in order to further improve system performance, particularly when the pulses have different time dependent emissions (col. 2, lines

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34-40; and col. 3, line 54 to col. 4, line 10) as in the present case. Therefore it would have been obvious to modify the system suggested by *Chen* in view of *Chval* so as to include a wavelength divider in order to affect light from the different layers in different ways in order to improve system performance.

Regarding claim 8, in the system suggested by *Chen* in view of *Chval* and *Fitzpatrick* (see explanation regarding claim 8 above), the system includes an optical element arranged to affect light in one layer differently than in the other layer. In addition, those skilled in the art appreciate that it is common in the art to arrange the scintillators and the convertor means offset from one another such that each convertor receives light from at least two scintillators. In such an arrangement, the optical element (necessarily being associated with the convertor) would inherently receive light from at least two scintillators.

Regarding claims 9-10 and 11-12, *Fitzpatrick* discloses that the optical element is a wavelength divider such as an interference filter (col. 4, lines 27-32).

Regarding claims 15, *Fitzpatrick* discloses, as is well known, that the converting means may comprise in functionally equivalent arrangements utilize either PMTs or photodiodes (col. 5, lines 1-5).

Regarding claims 16, *Fitzpatrick* discloses, as is well known, that the converting means may comprise in functionally equivalent arrangements utilize either PMTs or photodiodes (col. 5, lines 1-5). Silicon photodiodes are routine in the art and considered an obvious design choice.

9. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over *Chen* in view of *Chval* as applied above, and further in view of *Cherry* (US 6,552,348 B2).

Regarding claim 14, although *Chen* does not specifically disclose the use of a PS-PMT, *Cherry* discloses that functionally equivalent scintillator/convertor arrangements utilizing either a

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scintillator arrangement with different depths of cut and a non-position sensitive PMT (col. 2, lines 54-66) or and arrangement wherein the scintillator is directly coupled to a PS-PMT (col. 3, lines 9-15).

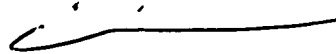
Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Albert J. Gagliardi whose telephone number is (571) 272-2436. The examiner can normally be reached on Monday thru Friday from 10 AM to 6 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David P. Porta can be reached on (571) 272-2444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

12. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Albert J. Gagliardi
Primary Examiner
Art Unit 2884

AJG